MASTER PLAN REPORT

FOR THE

TOWN OF ACTON CENTERIES ACTON, MASSACHUSETTS

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WOODLAWN CEMETERY MT. HOPE CEMETERY

June 1978

Grever & Ward Inc. Cemetery Planners East Aurora, N.Y. The Town of Acton lies in a "growth path" of the Boston Metropolitan Area. Situated between two major outer ring expressways (Interstate 95 and 495) and connected by a high-volume, limited-access highway (Route 2), Acton will develop at an accelerated pace for the next 20 to 40 years. The pace will affect every aspect of community behavior and while some activities will be more demanding at the outset, others will follow in turn.

Acton's two existing Cemeteries will be influenced by this growth just as certainly as all other community facilities and utilities. Woodlawn Cemetery, established in 1732 and Mount Hope Cemetery established in 1844, will very likely do more developing in the next 30 years than they did in the entire two preceding centuries. Interments can be expected to quadruple and lot sales will be even greater.

In 1977 the Town of Acton commissioned a Master Plan study for each Cemetery to determine the growth potential and configuration of each Cemetery, to establish modern design concepts, and to predetermine the required facilities that will be necessary to meet the anticipated growth.

The study for each Cemetery points out a need to increase the yield of burial space for each acre of remaining land from the present level of about 700 graves per acre to an average of 1100 graves per acre, a net increase of more than 60%. This presents a more conservative approach to land use but it will mandate other changes as well.

INTRODUCTION

Roads will be placed further apart to account for some space saving and modern layout methods, for lot subdivision, will yield the rest. Equipment must change to provide more labor productiveness and less damage to the Cemetery landscape.

To become self-supporting should be one of the goals of any cemetery, municipal or private. It will be necessary for Acton to constantly review its Cemetery precepts and economics, and update prices and methods annually. This should be the immediate goal of the Trustees, the Superintendent and the Elected Officers. The long-range goal should be to follow the course of the Master Plans; if necessary, making modifications to up-date the "state-of-the-art" in cemetery development.

The following descriptions of Woodlawn and Mt. Hope Cemeteries are quite parallel and cross references are made to each other. Both sites are very similar in terrain and soils, and consequently the design of each bears a similarity to the other. They should be thought of collectively as a community amenity and each be given the importance it deserves.

Future Development Concepts

Woodlawn Cemetery is quite reflective of many old New England Cemeteries. It is historic and has memorialization that dates back to the days of slate tablets. The overall development expresses this early history and the transition to modern day use. The physical layout of roads, the orientation of graves and methods of memorization accurately show the changing concepts of development over the span of its history. The transition is still ongoing.

Acton is in a growth area of the Boston Region and this can be clearly seen in the local commercial and residential developments. While it may not be particularly apparent now, the cemeteries in Acton will respond to this growth quite soon and the impact will first be noticed in accelerated lot sales. This is already recognized by the fact that non-resident sales are conditioned by appreciably high prices. Accelerated growth will make it important to depart from traditional development methods and exert a more conservative approach to land use. Eventually the goal must be to achieve the highest yield of burial space possible within the acceptable bounds of tradition, appeal and economical operation.

New Road Layout

The Master Plan road framework of the undeveloped parts of Woodlawn is designed to meet several requirements. First of all it is aligned to lead traffic and visitors smoothly throughout the Cemetery limits. The entrance is located so as to conduct visitors from Concord Road directly to the

Road Layout

office area where assistance and information is available. Funeral corteges can be properly met at the entrance and conducted quickly and safely off the highway. Large processions will be handled just as easily as smaller ones. The overall road framework is characterized by major alignments that distribute traffic easily to all parts of the cemetery and that also collect visitors and return them quickly and simply to the entrances at Concord Road.

The roads divide the usable burial land into sections of such size that will produce an economical yield of burial space for now and the future. The section sizes will range up to 200 feet in width, 300 feet in length and depending on the terrain, will average 1 to 1 3/4 acres in size. This is roughly two to three times larger than the typical section sizes that have been developed recently. In concept, it is simply a change to create fewer roads and more burials per acre. The value of permanent care funds per acre will increase and the cost of future maintenance will be more adequately supported by this design proposal.

The roads are also situated to use the existing terrain to maximum advantage. Wherever the land contours permit, the roads are placed in the lower parts of the terrain. This not only reduces earth grading to a minimum but it also encourages proper surface drainage from the uplying burial areas to the lower terrain at the roads. In most instances this produces a natural and logical drainage situation for

subsurface storm sewers. This concept of road placement also has another less tangible effect, in that the elevated burial land is more appealing and physcologically reassuring to the lot buyer. While the soils of Woodlawn are largely well-drained, this is not true in all other cemeteries, so there is advantage in letting the apparent elevated terrain confirm dryness.

Grading

The existing terrain has been utilized in such a way that only minimum cuts and fills are required throughout most of the land area. The largest cuts and fills occur along the roadways to either create uniform or usable road grades or they occur in areas where its necessary to modify an adverse site condition.

There is a 15 to 25 foot elevation differential throughout a large part of the usable land area. In order to achieve a grade transition between these general levels, road grades of 2 to 8 percent are necessary. Where the steeper situations occur it is important that the grades be quite uniform, particularly for winter driving conditions. Deeper fills and cuts are therefor necessary in some locations. Maximum grade changes of 2 to 6 feet are used to achieve the transitions.

In certain other locations, particularly along the northeast perimeter of the cemetery, stoney soil conditions make it desirable to fill the lower elevations to a depth of 3 or

Grading

4 feet or enough to allow unrestricted grave excavation to a depth of 5 feet.

Areas adjacent to the lowland meadow that will be used for burial purposes will have to be elevated by filling so that the bottoms of the graves will be above the ground water table. Maximum fills of 5 to 9 feet will be necessary, particularly in the burial section immediately west of Section 9. The area between the proposed pond and the surrounding roads will also be filled using sand material to be excavated from the pond; fill depths will be approximately 5 feet.

Earthwork Quantities

Thirty percent of Woodlawn or about 20 acres is presently developed to Cemetery use. The remaining 50 acres of undeveloped land will produce another 32 acres of burial space which will add one way or another to the amount of earthwork that must ultimately be handled. Soil excavated from graves in the past has been used in some places to manufacture new burial space. This same procedure will either be used with the future burial excavation for the sake of economy or it will have to be removed from the Cemetery at considerable expense.

About 40 acres of the undeveloped land will require surface cuts and fills to prepare it for roads and usable burial space. This will require 31,000 cubic yards of surface cutting and about 38,000 cubic yards of fill in order to produce usable and drainable surface configuration throughout the area. It is nearly an earth balance situation

and represents an average of less than 1,000 cubic yards per acre; about an 8 inch thickness. The haul distance for most surface cutting is short and constitutes a simple shift of material from one area to another. There is no problem of disposing this earth material because there is a place for it.

Burial excavation from future grave space, however, will be surplus and it will be necessary to dispose it in other than the burial sections. The 32 acres of future graves together with the existing burial space may generate as much as 75,000 cubic yards of soil that must be planned for disposal.

There are several places in Woodlawn where the disposal can be made. The valley between the Chapel and the original cemetery could be totally filled. Also the northwest part of the cemetery along Concord Road could be filled to a depth where the outcrop rock could be sufficiently covered to allow the area to be used for burials. Both of these locations will require extensive piping to allow the natural drainage ways to function inspite of the fills. Finally, the proposed pond could eventually be re-filled to a depth of & feet or more, so even that area could ultimately be used for ground burial.

An important thing to remember in connection with the overall earthwork is the long time span over which the work will be done. It may be 100 years before it will be necessary to consider filling any of the valleys and rock area or the pond area. Even then the filling will be done gradually and could take 50 to 100 years to complete. The timing is quite sketchy because of the uncertain annual rate of interment. The above estimates are based on an average rate of 200 interments per year; that is expanded from a current rate of 50 per year to a projected rate of 400 or more per year during the 21st century.

Pond Construction

The lowland meadow at the center of Woodlawn has qualities that could create an attractive naturalized focal point for the cemetery for the next 100 years or more. A new pond nearly 5 acres in size could easily be built by first stripping the loam from the meadow and then excavating a shallow layer of the underlying white sand. It would essentially be a "dug" pond and almost totally without the potential hazard of a dammed impoundment. Two aspects appear to make this bond feasible. First of all, the loam has a decided value. It could entirely eliminate future purchases of loam by the cemetery, or the loam could be locally at an equitable price, either of which sold would more than compensate for its removal. The loam is about 30 inches deep and it is estimated that more than 25,000 cubic yards may be available. Secondly the underlying sand could be used for making the fills (about 11,000 cubic yards) adjacent to the pond and the adjoining burial areas without moving it much more than 200 feet. can be done economically and since there are no firm constraints for either depth of pond or depth of fill, the job could be done primarily with the purpose of getting adequate water depth. The water depth should be about six feet to discourage most water plants, but it is expected that the water level would have to be elevated about two feet above existing grade in order to get the 6 foot depth. The dike is suggested to be placed about 500 feet upstream from the dam that originally flooded this area. be constructed in a natural manner using a very long and

Pond Construction

low-profile dike with a wide permanent spillway built in line with the outfall stream. The spillway could be "paved" with collected rock and stones placed directly on the sand, and the paving would extend from the pond on a gentle grade downward to meet the stream gradient. With such a method of construction, the spillway would always accommodate any amount of runoff and there could never be a hazardous failure of the dike.

The ground area surrounding the pond would be elevated about $1\frac{1}{2}$ to 2 feet above the water level and then grade upward to the roads. If the decision where to be made at some time in the future to fill the pond, surplus excavation from burials could be used to raise the grade of the pond bottom to that of the surrounding roads. The pond area would then be recovered to produce space for an additional 10,000 graves.

Site Drainage

The general drainage pattern of Woodlawn is from Concord Road northward to the stream along the north side of the cemetery. However, the easterly undeveloped part of the cemetery has poorly defined surface drainage. The main surface relief for this area is a depression in the terrain that occurs midway along the easterly side and flows eastward across private property. This same area is underlain with porous sandy soils which enhances the drainage, but this will remain satisfactory only while it is undeveloped. Once the area is graded and turfed, it will be necessary to supplement the natural drainage with a more positive drainage system. First, an easement will be required across

Site Drainage

the private property so that a discharge pipe can be placed from the cemetery to the drainage-way 600 feet to the east. Then a pipe system will be required within the cemetery to pick up surface runoff from the burial sections and roadways and drain the runoff water to the discharge pipe. This system will be located in the proposed roads of the area.

Elsewhere in the cemetery, other pipe systems will be required to adequately drain the land surface. These systems will also be located in the proposed roads and they will drain either to the stream or the pond.

The pipe systems should be designed to accommodate surface runoff from a moderate rainfall. Under most conditions pipe sizes for cemeteries can be designed on the basis of a one hour rainfall intensity that can be expected once every 10 years. Soils, slopes and other site conditions may increase the design limits for drainage, but it is rare that cemetery drainage is so critical that a 50 year rainfall intensity would be used.

In some areas, particularly on the west side of the cemetery, the ground water table is high enough that subdrainage may be required. When development of these areas is about to occur, the ground water conditions should be re-determined. If the water table is less than $5\frac{1}{2}$ below the surface during the wet seasons, porous subdrain lines should be installed at a depth of $5\frac{1}{2}$ feet to eliminate wet soil conditions. The subdrain lines can be led into the storm sewers.

Water Supply

Two water supply systems are planned for the undeveloped area of Woodlawn. One system is located east of the proposed pond and the other system is located west of the pond in the area of the Chapel.

The supply source for the east system is located at the office and is an existing 6" main with 80 p.s.i. working pressure. The supply source for the west system will originate at Concord Road where at least 80 p.s.i. working pressure may be expected, or if the supply line to the Chapel is large enough the west system may be tapped off that.

The design basis for both systems is a minimum demand of 30 gallons per minute at any point within either system, at a minimum working pressure of 45 pounds per square inch. This is more than adequate to satisfy ordinary hydrant (faucet) demand and it will also support the use of large diameter, impact-type area sprinklers if they are desired. Either system would be able to use at least 5 sprinklers at any one time, each with an effective diameter of approximately 100 feet and a delivery rate of 5 to 6 gallons per minute.

Hydrants (faucets) are spaced so that it would not be necessary to walk more than 150 feet to reach a faucet. If a manual sprinkler system should be used, it would be necessary to install short lateral lines with quick-coupling valves at the ends. It would be very unusual for a cemetery in the Northeast to use anything more sophisticated than a manual irrigation system.

Water Supply

The water supply systems are recommended to be installed at a frost-proof depth of $3\frac{1}{2}$ to 4 feet for maximum protection under all circumstances. Winter protection can be accomplished by gravity drainage into the storm drainage system or into dry wells placed at low points in the lines. The porous sandy soils will leach readily in most areas and the storm drainage lines will all be 4 to 5 feet deep, so both methods will work.

The water lines and fittings are recommended to be P.V.C., Schedule 40 plastic pipe (C=140) using ring-tite or solvent-weld joints. The minimum pipe size will be $l\frac{1}{4}$ inch diameter, which if limited irrigation were to be used, will provide the best flow with the least friction loss, at a very reasonable cost.

All water lines will be placed within the roadside easements and located approximately 3 feet off the pavement edge. The hydrants will be offset from the lines toward the road and they will use a double-swing-joint where it joins the supply line to allow movement of the hydrant in the event it is struck. A crushed stone dry well can be used below the hydrant for drainage.

Approximately 11,000 lineal feet of pipe will be required for all systems; 7300 feet of $1\frac{1}{4}$, 1300 feet of $1\frac{1}{2}$ " and 2500 feet of 2" pipe.

Supporting Facilities

As Woodlawn continues to develop there will be a need to enlarge some facilities and provide additional equipment. At present the office and maintenance center share the same building. This is sensible because it provides a high degree of communication and inter-action between administrative and service personnel. It should continue this way, but additional space for service and maintenance activities will be needed soon.

There is now a shortage of both shop and storage space now. Room is needed for the servicing of all equipment, and all major equipment that is required for daily usage should be stored inside where it can be secured. Shop space should be provided where inside maintenance work can be performed, particularly in the winter months when equipment must be repaired and restored to serviceable condition.

It is recommended that additional maintenance center be constructed adjacent to the present building and that at least 2000 square feet be provided at the same level. This could be situated to the northeast and be a single level building built into the same slope.

Crematory

The need for a crematory has been raised. About 90 cremations are reported annually for the Acton area. The nearest crematory is at West Newton 20 miles away, and others are located elsewhere at Mt. Auburn Cemetery, at Wooster and at Haverhill. The decision to provide a crematory

Crematory

is mainly one of economics. Cremation is a growing method in the interment industry and nationally at present represents about $6\frac{1}{2}\%$ of all mortalities. As the Acton area grows, and the cremation percentage increases, there will be more and morjustification for a Crematory.

A new retort, building and related facilities could easily run \$60,000. If it were a business venture it could be expected to amortize over a 10 year period, and it would be necessary to realize a gross income of \$25,000 annually for the facility. The national average cost per cremation is \$100 - \$110 which means that about 250 cremations would be necessary each year. This is not infeasible to predict with the next 20 years for the Acton area. At the present time, however perhaps only more study of the situation should be conducted and then at the proper time a positive move made to construct a crematory.

Equipment

An increasing burial rate and future land development activity makes it necessary that the cemetery have its own excavating equipment as soon as possible. Furthermore, with the changes that are proposed by the Master Plan for land use, the rental and use of a commercial backhoe will become inadvisable. The wider sections that are proposed by the plan to get better land use and higher burial yields, will not tolerate ordinary construction equipment because too much surface damage will occur from the narrow, heavy treads. Instead, a backhoe equipped with special floatation tires is needed so that it can travel over wide expanses of lawn without rutting and causing additional maintenance work.

Equipment

As the style of section layout changes, it will be desirable to use larger and more productive mowers that can easily cut 6 acres or more per day. Mowers such as the Yazoo and Howard with cuts up to 80 inches or more, will be needed to keep manpower at a minimum.

Production rate is going to be one of the major keys to future economics. Larger and more durable equipment will be necessary for use by fewer personnel on an acreage basis. More flexible equipment will also be advantageous, as will equipment that can be used the year around. Low-bearing equipment such as earth dump trailers, spraying rigs and, wide mowers will be necessary to avoid damage to turf in the wet months and the resulting repairs. While it is important to get production to a high level, it's equally important to avoid making more work through repairs.

Development Phasing

It usually takes 3 to 4 years to physically prepare interment areas for sales and burial. Add to that the time required for proposing and capitalizing the improvements and the time element may increase to 6 or 7 years. It's evident then that some long range planning is necessary for the development of cemetery land. Master planning is the earliest stage of that process. After the general scheme of development is established, there should be a proper sequence of moving from one area of the site to another. Part of this process is already determined by past development; the construction of roads, grading, water lines and drainage lines. Very logically, it would appear that the next development should occur adjacent to the

Development Phasing

last project. But this is not always the most logical thing to do! All things relating to the total site should first be taken into consideration; the overall grading and disposal of earth, the master scheme for extending utilities and especially the circulation of traffic within the occupied area.

In general, development should proceed from the front of the cemetery to the rear or more remote areas. The reason is that there will always be manuevering room to the rear for the development and there is much less chance that frontal areas will get "boxed in" to cause extraordinary construction problems later on. This is nearly happening on the east side of Woodlawn now; only a 200 foot strip of undeveloped land remains there.

Secondly, the upland areas should be developed in advance of the lower terrain. Very often, modest surface cutting is necessary to form the proper terrain configuration. This earth together with burial excavation can be used for elevating the lowland and making it more attractive than it may be in its natural state.

Utilities, particularly water supply, frequently originate at the frontage as it does at Woodlawn. It is quite simple and economical then to continue extending the utility systems as development progresses inwardly, but again it should be done according to a pre-determined plan.

Development Phasing

When development is sequenced from front to rear, it nearly always results in a loop-type of road system that easily moves traffic from the main collector roads to the laterals and then back to the collector roads again. This system is characterized by a perimeter road that invariably leads back to the entrance. It is simple, direct, and understandable for everyone.

It is recommended that Woodlawn be developed generally in the following sequence:

- Phase 1 The remaining frontage along Concord Road, rearward to the area of the office; about 13 acres.
- Phase 2 The upland area north of Section 8; about 6 acres.
- Phase 3 The lowland and slope area east of Phase 2; about 6 acres.
- Phase 4 The lowland and slope area west of Phase 2; about 4 acres.
- Phase 5 The area north and east of the Chapel; about ll acres.

Development Phasing

The pond can be built at any point in time. It is not sequenced into the construction of other areas, nor is any other area dependent on its construction. The earthwork and construction operations involved in the pond are totally confined to that designated area. The loam that is available within the pond area can be of immense value to the improvement of the burial areas but this material could also be stripped independent of the pond excavation.

Interment Space

The entire land area of Woodlawn Cemetery is approximately 70.5 acres. Of this, about 20.5 acres are already developed.

More than half of the remaining acreage can be used for ground burials and the balance will either be roads, pond or otherwise unusable land. Some of the land classified as unusable may eventually be converted to burial purposes as the need dicates and as certain physical changes occur in the land. For the forseeable future though, the land use is summarized below:

Total Area of Woodlawn Cemetery	70.5 acres
Existing Development	20.5 acres
Unusable Area (steep slopes, wetland buffering)	18.35 acres
New Roads (26' right-of-way)	8.30 acres
Future Burial Space	32.35 acres

Interment Space

The unusable area consists mainly of the pond and its surrounding area (9.65 acres) and the steep sloping, rocky land (6.50 acres) along the north side of Woodlawn. Elsewhere, the steep gully area south of the Chapel, approximately 2.2 acres, is unusable.

The 32.35 acres of land identified as future burial space will produce about 36,000 graves at single depth. As growth in the Acton area continues into the distant future, double-depth interment will be considered and most likely used, because the soil conditions are ideal in many areas, particularly east of the pond. This will add to the inventory of burial space and at the same time increase the amount of burial excavation that must be disposed.

It is entirely possible that the proposed pond will one day be filled with disposal soil from burial excavation to a depth of 8 or 9 feet. Should this happen, nearly 9 more acres of burial space would become available and produce at least 10,000 more single-depth graves.

The total inventory of burial space can be estimated at nearly 60,000 graves depending on what course of action is taken at a point in the future. With growth occuring rapidly in the Acton area it is not difficult to envision 200 to 400 burials annually within the next 30 years even when projected on a growth rate of only 5 to 7 percent. This is the history of similar areas. Within 75 years the annual burial rate could easily reach 1000 or more.

Interment Space

Based on this assumption, the usable land of Woodlawn as it now exists can be expected to last about 120 years.

The size of the graves now being used is proper and should continue to be used. However, non-useful space such as paths should be discontinued in the future because they reduce the yield of grave space. Instead, modern lot arrangements and layouts should be used that create the open space needed for operations and maintenance. The goal for burial space yield should be between 1000 and 1200 single-depth graves per acre.

Mainly because of the mobility of our society the burial needs of the average family are now for 2-grave lots. Throughout the country more than 80 percent of the lots sold are the two and three-grave size. Typically, 65 percent are two-grave monumented lots. This is what is desired and it's what should be provided. Some provision should be made also for non-monumented lots so that there is a range of choice available to the buyer; 10 to 15 percent of non-monumented lots is usually sufficient.

Cemetery Landscape

A major part of the undeveloped area of Woodlawn Cemetery is forested. The easterly part is a mixed forest of White Pine and deciduous hardwoods, particularly White Oak, and the westerly part is largely deciduous trees. It is a young forest and the average size is relatively small. The forest canopy however is quite solid and it is doing

Cemetery Landscape

a good job of restraining the undergrowth except along the edges of the forest where more light is admitted. Nearly all of the existing tree species are characteristically large in their maturity, so this condition will prevail and even improve as time passes, requiring little effort from the Cemetery.

The current attitude toward forest type trees in cemeteries is that they have very limited use and then usually outside the burial sections. There are many reasons for this, including the large leaffall, root damage, windfall damage, expensive removal costs and the high maintenance costs of pruning, feeding and spraying. There is a restrained use of such trees in cemeteries today. However there will be several unusable areas in Woodlawn particularly along the north side adjacent to the residential areas where it would be sensible to leave the forest trees untouched. In the proposed burial area it will be advisable to remove most of the forest trees as the need for the land is determined.

It would be pointless to disturb an otherwise stable forest condition that won't be used for 25, 50 or 100 years. The closed canopy will continue to restrain the undergrowth with no cost to the cemetery. It should remain so until a specific area of land can be identified well in advance of its need, say 10 years. Then that area should be selectively thinned on a programmed basis over a period of time so that ultimately only the desired trees remain and can be cultivated for long term usefulness. If the clearing is

Cemetery Landscape

done too rapidly, even the trees to be finally saved will be too spindly to survive high winds. A tree's roots are somewhat in proportion to their crown, small under forest conditions, but able to spread if they are relieved of competition. That is why the removal process must be slow and well in advance of need.

Durable species should be selected from the forest to remain (ex., Oaks, Sugar Maples) for they have long life spans and are worth the effort. But only a few of these (no more than 6 to 8 per acre) should be selected to enhance the landscape or excessive maintenance will occur.

New plantings for the burial sections should be mainly small to medium sized trees and shrubs. The trees should be selected for their open, light foliage, hardiness and seasonal attractiveness as well as for their compatibility with shrubs. The cultivated trees must be placed in close association with the shrubs so it is important that they not dominate a situation. The shrubs must be equally compatible, and be able to tolerate partial shade and compete successfully for water and nutrients.

In general the trees should have the qualities of the thornless Honeylocust, such as the fine-textured foliage, tough wood and resistance to disease. Several small Maples Crabapples, Hawthornes, Pears (fruitless) and Plums are

Cemetery Landscape

among those that can be considered. The shrubs can be both deciduous and evergreen and such as the small Yews, Japanese Hollies, some Junipers, dwarf Winged Euonumus and Arnold Dwarf Forsythia. The important thing with the shrubs is to use naturally restrained growth species in order to minimize the annual maintenance. The shrubs in general will be used as background for memorials and to define the limits of burial gardens. The cultivated trees will provide vertical accent in an other wise low profile landscape. All plants in general will be in organized units together with monuments so that all surface obstacles will be grouped for simplified maintenance. However, there will be some groups of plants and individual specimens that will be used only for land-scape and aesthetic purposes.

Land Acquisition

It has already been recommended that a drainage easement be secured across the private property on the east side of Woodlawn. In the same area there appears the possibility of acquiring the land to the north of the recommended easement. The land is well situated for an addition to the Cemetery, and while the need is obviously not pressing at this time, one of the cardinal rules of cemetery management is to acquire land whenever the opportunity arises at an equitable cost. A basic precept is that the purchase price can be as much as 1/10 of the "retail" value. A substantial land reserve helps quarantee an economically viable future and therefor any amount of land is worth investigating.